

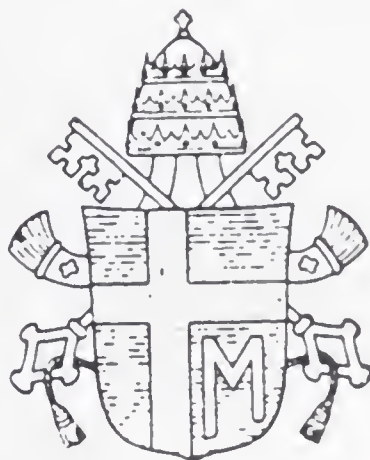
GREGORIAN REFORM OF THE CALENDAR

PROCEEDINGS OF THE VATICAN CONFERENCE
TO COMMEMORATE ITS 400th ANNIVERSARY
1582 - 1982

EDITED BY

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THE PAPAL BULL OF 1582 PROMULGATING A REFORM OF THE CALENDAR

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Introduction

Between the 4th and 15th of October, 1582 Pope Gregory XIII introduced the new calendar by the apostolic letter *Inter gravissimas*, dated 24 February, 1582. In this paper I would like to address the following questions concerning this letter. What authority had this letter? Who had constructed the new calendar? What were the contents of the calendar reform? How was it promulgated and published? How should we evaluate it in a religious and ecumenical perspective?

The Authority behind the Decree

The decree of 1582 was issued with papal authority. It is written in the form of an apostolic letter or papal bull, as an ecclesiastical law.

The Pope under whose authority the calendar reform was instituted, was Gregory XIII (1502-1585). Born in Bologna in 1502 of a noble family, Ugo Buoncompagni studied law and became lecturer and judge in his native town. In 1539 he moved to Rome and among other tasks he was sent to the Council of Trent both in 1549 and during its last year 1562-1563. He was ordained a priest and became bishop of Veste; on 12 March, 1565 he was elected Cardinal and sent to Spain as *legatus a latere*. In 1572 he was elected Pope. Pope Gregory was 75 years old when he sent to all Catholic princes his proposal for the reform of the calendar, the *Compendium novae rationis restituendi Kalendarium*, (Compendium of a

New Way of Restoring the Calendar) in 1577. When in 1582 he signed the apostolic letter *Inter gravissimas* he was 80 years old but still in the best of health. Pope Gregory was so happy for the achievement of his calendar reform and so grateful to God that ever since that date he had the Litanies said every day in his palace with the assistance of all employees.¹

From the very start of the apostolic letter Pope Gregory appeals to the authority of the Council of Trent. The first words "*Inter gravissimas*" mean "among the most serious" and the first sentence reads:

Among the most serious tasks, last perhaps but not least of those which in our pastoral duty we must attend to, is to complete with the help of God what the Council of Trent has reserved to the Apostolic See.

At the last session of the Council of Trent, on 4 December, 1563 the last decree left it to the Pope to finish and publish what had been prepared by the Fathers of the Council for the reform of the Mass book and the breviary because time had run out for them.² Pope Pius IV could not fulfill this task before his death in 1566, but his successor the holy Pope Pius V († 1572) promulgated a reformed breviary in 1568³ and a reformed Roman Mass book in 1570. The breviary incorporated also a provisional calendar reform. The calendar's indications of the new moons were moved by four days back to the time when the moon was really in conjunction with the sun. New discrepancies were to be prevented by an additional leap day every 300 years, from 1800 onwards. This awkward reform seems to have had little effect. Ten years later, in 1578, Pietro Galesino published in Milan a new martyrology on the authority of Pope Gregory XIII. It followed the old, traditional calculation of the new moon's age. Juan Salón criticized the corrected cycle.⁴ In 1579 Giuntini⁵ referred briefly to this measure of Pope Pius V.

The Commission for the Reform of the Calendar

The decree of the Council does not say a word on calendar reform but only speaks of a reform of the Mass book and the breviary, so the calendar reform undertaken by the Pope can only be said to be implied by the decree of the Council. According to the letter of the decree Pope Pius V executed the decree in his reform of the Mass book and breviary. But as the *Compendium* says: The work of Pope Pius V was not entirely complete and perfect, as long as the year and the calendar of



CALENDARIVM GREGORIANVM PERPETVVM.

Orbi Christiano vniuerso à GREGORIO XIII. P. M. pro-
positum. Anno M. D. LXXXII.



GREGORIUS EPISCOPVS SERVVS SERVORVM DEI AD PERPETVAM REI MEMORIAM.



INTER grauissimas Pastoralis officij nostri curas, ea postrema non est, ut quae à sa-
cro Tridentino Concilio Sedis Apostolicae reseruata sunt, illa ad finem optatum, Deo
adiutore perducantur. Sane eiusdem Concilij Patres, cum ad reliquam cogitatio-
nem Breuarij quoque curam adiungerent, tempore tamen exclusi rem totam ex
ipsius Concilij decreto ad auctoritatem & iudicium Romani Pontificis retulerunt.
Duo autem Breuarij praecipue continentur; quorum unum preces, laudesque diui-
nas festis, profectisque diebus persoluenas complectitur, alterum pertinet ad annuos
Pascha, festorumque exco-pendendum recursus, Solis, & Luna motum metiendos: Atque illud quidem
felicitis recordationis Pius V. praedecessor noster absoluendum curauit, atque edidit. Hoc vero, quod ni-
mirum exigit legitimam Calendarij restitutionem, iamdiu à Romanis Pontificibus praedecessoribus no-
stris, & saepius tentatum est, verum absolutum, & ad exitum perducere ad hoc usque tempus non potuit, quod
rationes emendandi Calendarij, quae a caelestium motuum peritis proponebantur, propter magnas, &
fere inextricabiles difficultates, quas huiusmodi emendatio semper habuit, neque perennes erant, neque
antiquos Ecclesiasticos ritus incolumes (quod in primis hac in re curandum erat) seruabant. Dum
itaque nos quoque crediti nobis, licet indignis, à Deo dispensatione freti, in hac cogitatione, curaque
versaremur, allatus est nobis liber à dilecto filio Antonio Lilio artium, & medicina doctore, quem quon-
dam Aloysius eius germanus frater conscripserat, in quo per nouum quendam Epactarum Cyclum ab eo
excogitatum, & ad certam ipsius aurei numeri normam directum, atque ad quaecunque anni solaris
magnitudinem accommodatum, omnia, quae in Calendario collapsa sunt, constanti ratione, & seculis o-
mnibus duratura, sic restitui posse ostendit, ut Calendarium ipsum nulli unquam mutationi in poste-
rum expositum esse videretur. Nouam hanc restituendi Calendarij rationem exiguo volumine com-
prehensim ad Christianos Principes, celebrioresque vniuersitates paucos ante annos misimus, ut res,
quae omnium communis est, communem etiam omnium consilio perficeretur; illi cum, quae maxime opra-
bamur, concordēs respondissent, eorum nos omnium consensione adducti, viros ad Calendarij emenda-
tionem adhibuimus in alma Urbe harum rerum peritissimos, quos longe ante ex primarijs Christiani
orbis nationibus delegeramus: Is cum multum temporis, & diligentia ad eam lucubrationem adhi-
buissent, & Cyclostam veterum, quam recentiorum undique conquisitos, ac diligentissime perpen-
satos inter se contulissent, suo, & doctorum hominum, qui de ea rescripserunt, iudicio hunc praeceteris elegerunt
Epactarum Cyclum, cui nonnulli etiam adiecerunt, quae ex accurata circumspectione visa sunt ad
Calendarij perfectionem maxime pertinere.

FIG. 1. The first page of the decree *Inter Gravissimas* as it appears in Tome V of the *Opera Mathematicorum* of Christoph Clavius. Courtesy of the Library of the Jesuit Curia, Rome.

the Church were not corrected. So the successor to Pope Pius V, Gregory XIII, had to assume that the task imposed by the Council had yet to be fulfilled. And certainly, the call for reform put forth both in previous Councils and at other occasions included the request for a correction of the calendar. So Pope Gregory knew that he was supported by a strong and long consensus within Western Christianity when he started work on the reform of the calendar.

To this purpose he nominated a commission, called *congregatio* according to Roman usage. The date of its origin is not known. Christoph Clavius, one of the most assiduous members of the commission, said in 1603 that for a period of ten years the commission held meetings in Rome under the authority of the Pope.⁶ In 1585 some members of the commission addressed themselves to the Pope while its president Cardinal Sirleto was ill. That same year both Pope Gregory and Sirleto died. We may take this as the end of the activity of the commission.⁷ Thus it would have originated in 1575. However, if we take 1582 as the final year, then the commission would have originated about 1572. Indeed, the protonotarius Spetianus said in 1581 that Cardinal Sirleto had occupied himself with the problem for ten years.⁸ In the *Explicatio*⁹ Clavius said that no better way of correcting the calendar than the Gregorian reform had occurred to any of those who had collaborated in it, not even after a long research during about ten years.¹⁰

The Spanish Franciscan Juan Salón, published in 1576 a book on *The Emendation of the Roman Calendar and the Determination of the Pascal Solemnity*.¹¹ In the preface he urges the Pope and the cardinals to act because the intentions of the Council of Trent were not yet carried out. He then mentions his intervention with the Bishop of Sorà, president of the "Congregation on the Determination of the Mobile Feasts" (*Congregationis Super Reductionem Festorum Mobilium*); this intervention took place in the year before, in the jubilee year 1575. In August 1576 Giovanni Padovani published in Italian a work on the "Reform of the Year".¹² In the dedication to Agostino Valerio, Bishop of Verona, he requests him to give notice of this book to the Holy Father "who for many reasons which will be given hereafter has to apply all diligence in making this reform soon". In 1577 Padovani published a booklet on *Computus*¹³ and in the dedication to Bishop Valerio he mentions that the Pope is said to have undertaken the reform. But he has also heard that it proceeds very slowly because the very learned consultors could not agree on the fundamentals;

everyone attacked the opinion of the others and defended his own, so no hope existed for a mature result.

What proposals did the commission have at its disposal from which to choose? In addition to several proposals prior to the Council of Trent some new ones had arisen.

In 1576 Juan Salón published his proposal in the book mentioned above. He wished to change the vernal equinox to 24 or 25, not 21 March. After each cycle of 124 years the golden number would be adjusted to the anticipated equinox and at times also to the anticipated new moons. He has also described this proposal in manuscripts.¹⁴ Also in Salón's hand are two other handwritten proposals.¹⁵ The first one was written in 1577¹⁶ at the order of Cardinal Sirleto, who was then president of the commission.¹⁷ The second manuscript is based on mean motions of the moon and proposes that a leap day be omitted every 100 or 104 years and that the golden number then be corrected.¹⁸ Finally, Salón refers to his book in a short, handwritten memorial¹⁹ proposing that a leap day be omitted every 124 years.

"From the beginning of his pontificate" Pope Gregory XIII, urged on by Cardinal Benedict Lamellini, had commissioned Tommaso Gigli to have another book on the correction of the Roman calendar and the mobile feasts evaluated by experts mathematicians in Rome.²⁰ Tommaso Gigli, Bishop of Sora, from Calabria, was the Pope's treasurer. The book in question was composed by Luigi Giglio, physician and mathematician. Giulio Aromolo²¹ has written the biography of this doctor from Calabria who was to become the primary author of the calendar reform. Luigi Giglio, or Aluise Baldassar Lilio, was born in Cirò in Calabria about 1510 in a family of modest means. He studied medicine and also astronomy in Naples;²² he settled in Verona²³ and died in 1576. Although he was alive at the time his proposal was presented in Rome, it does not seem that he made the presentation. His brother Antonio, also a physician and astronomer, promoted his cause. In 1575 Bishop Tommaso Gigli asked Salón to give his opinion on the proposal of Giglio. Salón says that initially he was well disposed towards the invention of Giglio but changed his mind when others made objections.²⁴ Giglio had proposed a cycle of epacts. The epact of the year is the age of the moon at the start of the year. The term *epact* had been in use before Giglio; his invention was the insertion of epacts in the perpetual calendar in combination with the table of epacts and the table of adjustments, as will be explained later. Salón rejected the epact cycle for three reasons: 1) it would not last long unless it were

frequently adjusted; 2) it is hardly intelligible for the more simple-minded who make up the large majority of clerics;²⁵ 3) merely because of its novelty it will not please. In the same year, 1575, the learned Archbishop of Patras, Alessandro Piccolomini, came to Rome²⁶ and he had several discussions with Antonio Giglio, the brother of Luigi, as well as with his collaborators in the composition of the proposal. Piccolomini also read Giglio's book at the suggestion of Tommaso Gigli, the president of the commission, but he did so quickly. Although Antonio Gigli explained and defended his brother's proposal in friendly conversations, Piccolomini was not convinced, or rather he admitted that he did not grasp well Giglio's epact cycle and so he also concluded that it was too difficult for clerics.²⁷

Another expert consulted by Tommaso Gigli was Giovanni Carlo Ottavio Lauro, a scientist in Rome. He kept Giglio's work for three months and used it in preparing his own proposal for the reform. In the meantime mathematicians and other experts, gathered under the presidency of Tommaso Gigli, had repeatedly testified their approval of Giglio's work, even when the president urged them to write down the very smallest defects in this proposal. On the other hand they rejected Lauro's work as incorrect and useless. Once again for "many months" Lauro kept Giglio's book under pretext of correcting the errors. The result was again submitted to the judgement of the experts and found to be an incorrect and misunderstood application of Giglio's inventions. On the contrary the experts maintained that the proposal of Giglio was the best of all, even the best possible.

At this moment the experts lost their patience and addressed themselves directly to the Pope; they asked that the reform be expedited notwithstanding the "chimeras" of Lauro, whom they mention, under the name of Giovanni Carlo, as an astrologer (*astrologo giuditiario*). The copy of this memorial in the Vatican Library²⁸ has no date or signature. The handwriting might be that of Christoph Clavius, Jesuit and professor of mathematics at the Collegio Romano; the spirit is certainly his. On 30 July, 1575 Lauro was paid for his work on the calendar reform.²⁹ Lauro's manuscript, composed in 1575, is preserved at the Vatican Library.³⁰ It avoided mentioning epacts and kept to golden numbers, but instead of one perpetual calendar (with epacts) Lauro constructed a table with virtually thirty calendars — that is, thirty different distributions of golden numbers over the days of the year instead of the old calendar with only one distribution of golden numbers. It is in principle a viable solution. The disadvantages are the abandonment of the perpetual calendar

and the lack of a clear derivation of the distribution of golden numbers; the user has to take them from Lauro's table without sufficient explanation of how the golden numbers change every century. Later, in his explanation of the Gregorian reform, Clavius rejected a solution without epacts because using thirty calendars would be too cumbersome.³¹ Giovanni Battista Gabio, Professor of Greek at the Pontifical University, La Sapienza, was also asked to give his opinion on Giglio's proposal. Gabio praised it but found that the booklet of Lauro should not be rejected.³² Gabio had honoured Lauro with a Greek poem of six lines in his booklet on the calendar reform.³³

The above discussion proves that the proposal of the brothers Giglio reached the commission in 1575, shortly before the death of Luigi Giglio in 1576, and that, although it was received with doubts and some resistance,³⁴ in some way it triggered serious work on the reform. As to the resistance to the proposal of the brothers Giglio we have more evidence in another memorial addressed to the Pope. It warns that the calendar to be sent out to the princes has not been approved by mathematicians in Rome, as the Pope has been told, but by the authors and other interested persons. It asks for a closer examination with the intervention of Cardinal Sirleto and Monsignore Seraffino (= Séraphim Olivier) and disinterested theologians and mathematicians.³⁵ Indeed, at some moment Cardinal Guglielmo Sirleto replaced Tommaso Gigli as president of the commission. As of 1577, there is noted on all documents on the calendar reform addressed to the Pope: "al card.^{le} Sirleto".³⁶ The promotion of Gigli to the bishopric of Piacenza, on 12 November, 1576³⁷ may indicate the approximate date of the change of presidents. As late as 9 September, 1577 Gigli wrote from Piacenza to Sirleto to ask if the reform plan by Giovanni Carlo had been printed with some points corrected.³⁸ Gigli died in 1578.

It was the able leadership of Sirleto, and not primarily the presentation of Luigi Giglio's project by his brother Antonio, that rescued the commission, if indeed it was Sirleto who definitely decided to accept Giglio's proposal after the hesitations of his predecessor. Guglielmo Sirleto (1514-1585), born in Guardavalle near Stilo in Calabria, was nominated Cardinal by Pope Pius IV in 1565.³⁹ He was a great scholar, and particularly a hellenist. He had been a serious candidate at the conclaves which elected Pius V and Gregory XIII. He had taken an active part in the reform of the Roman breviary and missal under Pope Pius V.⁴⁰ Other members of the commission cannot be identified at this first stage but

several of them may be on the list of members which we will find in 1580, and a few will be identified as members as early as 1577.

Finally the invention of Luigi Giglio triumphed over all objections and rivals. On 5 January, 1578 ⁴¹ Pope Gregory sent it out to the scientific world in the form of a compendium. The author of the compendium is a theologian from Toledo, Pedro Chacón (1526/7-1581), in Italy called Pietro Ciaconio, ⁴² clearly at that time already a member of the commission. He died on 26 October, 1581. ⁴³ There are some thoughts for the covering letter to the Roman Emperor ⁴⁴ from the hand of Cardinal Sirleto. The final letter has been printed ⁴⁵ and is dated 11 January, 1578.

When Christoph Clavius, the Jesuit professor of mathematics at the Collegio Romano, a German from Bamberg in Bavaria, speaks about the preparation of the compendium in his *Explicatio*, published in 1603, he says "we", indicating that he worked on the commission as early as 1577. ⁴⁶ Clavius was certainly a hearty supporter of the invention of Luigi Giglio, whom he recognizes as the principal author of the Gregorian reform. ⁴⁷

We owe much gratitude and praise to Luigi Giglio who contrived such an ingenious Cycle of Epacts which, inserted in the calendar, always shows the new moon and so can be easily adapted to any length of the year, if only at the right moments the due adjustment is applied.

The Compendium of 1577

The *Compendium* addresses itself to "peritis mathematicis", expert mathematicians, and was sent to them through the "Christian princes" and the universities. Among these Christian princes were reckoned only Roman Catholic princes; at least, there is no trace of the *Compendium* having been received by other Christian, not Roman Catholic-princes. It was sent as a printed booklet of twenty pages in quarto. ⁴⁸ The text has been faithfully reprinted in Christoph Clavius' *Romani Calendarii... Explicatio*, Rome 1603 and Mainz 1612, with the exception of the severe prohibition by the Pope, formulated by Cardinal Sirleto, to reprint the *Compendium*. According to the preface the book of Luigi Giglio had been offered to the Pope but not yet printed; however, for mathematicians the compendium would suffice.

The substance of the proposal by Giglio is that it is no longer the golden number which determines the Easter date but the epact of the year. This is the age of the moon at the beginning of the year and also the

number of days left in the preceding year after the last completed lunation. This number was, up to then, adequately and uniquely determined by the golden number. For example when the golden number was 7, the epact of the year was always XIV and this, together with the Sunday letter, fixes the date of Easter. However, in the course of time the golden number had become unreliable as an indicator of the epact. When the golden number was 7, for example, the epact of the year was, in reality, not XIV but XVIII in the days of Pope Gregory. Therefore Giglio took the step of breaking the unequivocal link between epacts and golden numbers. To a given golden number may hereafter, in the course of the centuries, be joined any epact, any of the thirty possible epacts; therefore Giglio composed a table, the expanded table of epacts with the 19 golden numbers on top and underneath thirty rows of possible epacts to each golden number. See Table I on pages 212-213, the one finally adopted by the commission. This is the essence of Giglio's proposal. Its immediate consequence is that in the perpetual calendar to each date is assigned not a golden number but an epact. If the epact of the year is V, then all dates of the year with epact V will be days of new moon.

The next question is to determine which of the thirty rows is to be used. Each row is given a letter as an indicator. At the end of every new century we may have to shift to another row. Once this shift has been determined, a list of centuries can be made up with a letter assigned to each century which indicates the row valid for that century.

The series of epacts has to be changed almost each century because Giglio applied both the solar and the lunar adjustment at the end of centuries. For the solar adjustment this had been proposed in 1564 by Pietro Pitati of Verona. Giglio accepts the Alphonsine figure for the length of the year: 365 days, 5 hours, 49 minutes and 16 seconds, which is $1/134$ of a day less than one Julian year ($365\frac{1}{4}$ days). Now $1/134 \cong 3/400$ so in 400 years the equinox will be anticipated 3 days. To correct for this, Giglio, following Pitati, proposed to leave out the leap day for centennial years not divisible by 400. This measure disturbs the Metonic cycle, so that the moon will be one day late every time the leap day is left out; the epact of the next year will be one less than normal, so we have to shift to the next following row of epacts. In his *Explicatio* Clavius calls this a postponement (*postpositio*) of the moon.⁴⁹ The opposite happens when a similar arrangement is applied for the adjustment to the motion of the moon. After one Metonic cycle of 19 years the moon anticipates its phases 1 hour 27.5 minutes or one day in 312.7 years which makes 8 days.

in 2500 (+ 1.6) years. Giglio corrects this by increasing the epacts by one unit every 300 years and the last time (eighth) after 400 years.

Finally, one has to correct, once for all, for the error accumulated since the Council of Nicaea up to 1580, whereby the equinox had moved from 21 March to 11 March and the moon had been anticipated by four days. This is done by leaving out ten days and jumping to the right row of epacts. The ten days could be left out all at once or⁵⁰ one could omit leap years for a period of 40 years. The first alternative is said to have been proposed by Nicholas of Cusa and Herman Zoest at the Council of Basel.⁵¹

Some Comments on the Compendium

Through the nuncios the Holy See transmitted the *Compendium* to the princes and universities. The experts returned their comments to their universities and princes, the princes sent them on to the Pope with their own declaration. The Secretary of State, Tolomeo Gallio, Cardinal de Como, passed them on to Cardinal Sirleto.⁵² Kaltenbrunner described each of these comments individually in his third paper on the calendar reform and Schmid supplemented this.⁵³ However, some reactions deserving special mention have been found after their pioneering work.

Most surprising is the scorn of Kaltenbrunner for the judgement given by the mathematician of the Duke of Savoy, Giovanni Battista Benedetti: "He is so submissive that it appears he cannot judge other than with complete affirmation."⁵⁴ Evidently, Kaltenbrunner failed to recognize Benedetti as one of the greatest scientists of his age. Indeed, Kaltenbrunner had only seen the letter by Duke Emanuel Philibert, dated 31 May, 1578,⁵⁵ which is a covering letter to the comments by Benedetti. The opinion of Benedetti himself is preserved in another place⁵⁶ and dated 1 April, 1578. Benedetti prefers the Easter date to be fixed according to the true motions of sun and moon rather than by cycles. He finds that the Prutenic tables are sufficiently exact for this purpose. Furthermore not ten days, not even 14, but 21 days should be left out in order to make the first day of January the winter solstice. The lengths of the months are to be adjusted so that they coincide with the presence of the sun in each of the twelve zodiacal signs. Surely, these time intervals change their lengths in the course of time because of the motion of the perihelion of the earth, but Benedetti assures us that only after 24,000 years will an adjustment be

TABLE I. - EXPAND

Years	Golden Numbers									
	3	4	5	6	7	8	9	10	11	
Julian	P	*	XI	XXII	III	XIIII	XXV	VI	XVII	XXVIII
	N	XXIX	X	XXI	II	XIII	XXIIII	V	XVI	XXVII
	M	XXVIII	IX	XX	I	XII	XXIII	IIII	XV	XXVI
	H	XXVII	VIII	XIX	*	XI	XXII	III	XIIII	XXV
	G	XXVI	VII	XVIII	XXIX	X	XXI	II	XIII	XXIIII
	F	XXV	VI	XVII	XXVIII	IX	XX	I	XII	XXIII
	E	XXIIII	V	XVI	XXVII	VIII	XIX	*	XI	XXII
1582-1699	D	XXIII	IIII	XV	XXVI	VII	XVIII	XXIX	X	XXI
1700-1899	C	XXII	III	XIIII	XXV	VI	XVII	XXVIII	IX	XX
1900-2199	B	XXI	II	XIII	XXIIII	V	XVI	XXVII	VIII	XIX
2200-2299	A	XX	I	XII	XXIII	IIII	XV	XXVI	VII	XVIII
2400-2499										
2300-2399	u	XIX	*	XI	XXII	III	XIIII	XXV	VI	XVII
2500-2599										
	t	XVIII	XXIX	X	XXI	II	XIII	XXIIII	V	XVI
	s	XVII	XXVIII	IX	XX	I	XII	XXIII	IIII	XV
	r	XVI	XXVII	VIII	XIX	*	XI	XXII	III	XIIII
	q	XV	XXVI	VII	XVIII	XXIX	X	XXI	II	XIII
	p	XIIII	XXV	VI	XVII	XXVIII	IX	XX	I	XII
	n	XIII	XXIIII	V	XVI	XXVII	VIII	XIX	*	XI
	m	XII	XXIII	IIII	XV	XXVI	VII	XVIII	XXIX	X
	l	XI	XXII	III	XIIII	XXV	VI	XVII	XXVIII	IX
	k	X	XXI	II	XIIL	XXIIII	V	XVI	XXVII	VIII
	i	IX	XX	I	XII ³	XXIII	IIII	XV	XXVI	VII
	h	VIII	XIX	*	XI	XXII	III	XIIII	XXV	VI
	g	VII	XVIII	XXIX	X	XXI	~~IV~~	XIII	XXIIII	V
	f	VI	XVII	XXVIII	IX	XX	I	XII	XXIII	IIII
	e	V	XVI	XXVII	VIII	XIX	*	XI	XXII	III
	d	IIII	XV	XXVI	VII	XVIII	XXIX	X	XXI	II
	c	III	XIIII	XXV	VI	XVII	XXVIII	IX	XX	I
	b	II	XIII	XXIIII	V	XVI	XXVII	VIII	XIX	*
6600-	a	I	XII	XXIII	IIII	XV	XXVI	VII	XVIII	XXIX

* From Clavius, *Explicatio* 1612, pp. 110-111.

	11	12	13	14	15	16	17	18	19	1	2
I	XXVIII	IX	XX	I	XII	XXIII	IIII	XV	XXVI	VIII	XIX
	XXVII	VIII	XIX	*	XI	XXII	III	XIIII	25	VII	XVIII
	XXVI	VII	XVIII	XXIX	X	XXI	II	XIII	XXIIII	VI	XVII
I	XXV	VI	XVII	XXVIII	IX	XX	I	XII	XXIII	V	XVI
	XXIIII	V	XVI	XXVII	VIII	XIX	*	XI	XXII	IV	XV
	XXIII	IIII	XV	XXVI	VII	XVIII	XXIX	X	XXI	III	XIIII
	XXII	III	XIIII	25	VI	XVII	XXVIII	IX	XX	II	XIII
	XXI	II	XIII	XXIIII	V	XVI	XXVII	VIII	XIX	I	XII
	XX	I	XII	XXIII	IV	XV	XXVI	VII	XVIII	*	XI
I	XIX	*	XI	XXII	III	XIIII	25	VI	XVII	XXIX	X
	XVIII	XXIX	X	XXI	II	XIII	XXIIII	V	XVI	XXVIII	IX
	XVII	XXVIII	IX	XX	I	XII	XXIII	IIII	XV	XXVII	VIII
	XVI	XXVII	VIII	XIX	*	XI	XXII	III	XIIII	XXVI	VII
	XV	XXVI	VII	XVIII	XXIX	X	XXI	II	XIII	XXV	VI
	XIIII	25	VI	XVII	XXVIII	IX	XX	I	XII	XXIIII	V
	XIII	XXIIII	V	XVI	XXVII	VIII	XIX	*	XI	XXIII	IIII
	XII	XXIII	IV	XV	XXVI	VII	XVIII	XXIX	X	XXII	III
	XI	XXII	III	XIV	25	VI	XVII	XXVIII	IX	XXI	II
X	X	XXI	II	XIII	XXIIII	V	XVI	XXVII	VIII	XX	I
III	IX	XX	I	XII	XXIII	IV	XV	XXVI	VII	XIX	*
II	VIII	XIX	*	XI	XXII	III	XIIII	25	VI	XXVIII	XXIX
I	VII	XVIII	XXIX	X	XXI	II	XIII	XXIIII	V	XXVII	XXVIII
	VI	XVII	XXVIII	IX	XX	I	XII	XXIII	IIII	XVI	XXVII
II	V	XVI	XXVII	VIII	XIX	*	XI	XXII	III	XV	XXVI
I	IIII	XV	XXVI	VII	XVIII	XXIX	X	XXI	II	XIIII	XXV
I	III	XIIII	25	VI	XVII	XXVIII	IX	XX	I	XIII	XXIIII
	II	XIII	XXIIII	V	XVI	XXVII	VIII	XIX	*	XII	XXIII
	I	XII	XXIII	IIII	XV	XXVI	VII	XVIII	XXIX	XI	XXII
K	*	XI	XXII	III	XIIII	25	VI	XVII	XXVIII	X	XXI
III	XXIX	X	XXI	II	XIII	XXIIII	V	XVI	XXVII	IX	XX

necessary. The proposal is not only interesting and original but also very rational because, by eliminating all reference to the moon, it makes the year entirely solar. (It had also been the intention with the Julian calendar to let the year begin at winter solstice.) But, of course, this proposal was too radical for the commission which scrupulously, but also wisely, kept to tradition as far as possible, without introducing unnecessary innovations.

Kaltenbrunner was right in his assumption that the publications on the calendar by Rastelli and by Giuntini in 1579 were occasioned by the *Compendium*.⁵⁷ In his dedication to Giacomo Boncompagni, scientist at Perugia, Rastelli recalls that during a visit to Rome he heard from members of the commission about the planned reform; he thinks that it is so complicated that it will not last long. Rastelli hopes that Giacomo Boncompagni will present his proposal to the Pope. Having stated several alternatives, Rastelli mentions the possibility of leaving out eleven days after 4 October, 1579 because then there are no feasts of saints. He prefers, however, that the equinox be changed to 24 or 25 March, as most commentators do, but he is unique in his final preference for the alternative method of leaving out leap days during 56 years. That is all that the little book of 72 pages deals with.⁵⁸

Francesco Giuntini is the author of the *Synopsis de Restitutione Calendarii*. He was a doctor of theology and attached as a theologian to the household of Prince François Valet, brother of the King of France and Duke of Alençon. He states that in 1580 the equinox should fall on 10 March and Giuntini calculates from this the length of the year as 365 days, 5 hours, 47 minutes and 21.6 seconds, accepting 25 March as the date for the equinox at the beginning of the Julian calendar. From this rather low value for the length of the year results an anticipation of the equinox by one day every 114 years. Giuntini proposes that the equinox be moved to 24 March by leaving out 14 days so that one does not violate the order of Sunday letters or the solar cycle. Giuntini ignores the proposal of a perpetual calendar because he keeps to the plan of Pope Pius V of adjusting the cycle of golden numbers after every 304 years.⁵⁹

The Senate of Venice asked the astronomer of the University of Padua, Giuseppe Moletto, to respond to the *Compendium*. Moletto would have the equinox moved to 25 March where it was in the years when Julius Caesar and Jesus Christ lived.⁶⁰ Moletto found the proposal inadequate, even in contrast with astronomical rules, though in perfect accord with those of the computists.⁶¹ As many experts in astronomy, he found it necessary to

follow the true motions of sun and moon instead of mean motions which are only human inventions.⁶²

The reaction of Paolo Clarante is rather spontaneous, at least not official. He published in 1578 at Perugia *Ad Principes Christianos, De Paschatis Chronologia Quaestiones XVII*, 17 queries on the chronology of Easter, addressed to all Christian rulers. It is, for the most part, an alternative to the *Compendium*. The copy in the Vatican Library⁶³ begins with a handwritten letter to the Pope reminding him that the author many months before through Cardinal Sirleto had given notice to the Pope that he, Clarante, had reviewed the *Compendium* and that the Pope wished to have this critique sent to him anonymously, as a private matter.⁶⁴ Now the author requests the Pope to "embrace" his calendar, about which Cardinal Farnese had spoken to the Pope, and to have it sent to the kings. The name of Cardinal Sirleto is also on the backside of the book, in the same handwriting. One month later Clarante urged the acceptance of his proposal in a handwritten memorandum addressed to the Pope.⁶⁵

The eagerness of the commentators to have their thoughts published in print is astonishing. Piccolomini revealed the motive for this in the following respectful terms:⁶⁶

I was not motivated by the fear that my writings would be altogether lost, as some in similar circumstances might perhaps fear because their writings must ultimately be sent to Rome where they are subjected to the judgement of people who themselves wrote about the same matters; they, both authors and critics would have to pronounce a verdict on their own cause; one might, therefore, fear that condemnation would be assured beforehand especially since one who resides in Rome may catch the ear of influential persons and thus by constantly urging persuade them. As I have said, from such fears and preoccupations I am altogether free; because I think that the scholarship of those who have carefully dealt with or are dealing with this matter in Rome is combined with the highest intellectual integrity.

The Criticism by Patriarch Ignatius

Finally, there is one thorough criticism to the *Compendium* which has never been well described in the history of the calendar reform. At the end of 1577 or in the first days of 1578 a person arrived in Rome who said that he was the ex-patriarch of Antioch, of the Syrian Jacobite Church

(of the Nestorian confession). He sought reconciliation with God and with the Apostolic See. He was accompanied by just one servant and held a recommendation by the Patriarch of Aquileia.⁶⁷ Was he a fake? Provisionally lodging was assigned to him and he proved to be sincere. When he became a patriarch, in 1557, he had chosen the name Ignatius; his original name was Na'amataallah. On 28 March, 1576 he abdicated and from Venice he travelled to Rome.⁶⁸ On 30 January, 1578 Pope Gregory received him in audience.

In Syria and on his journey he had impressed others by his knowledge of medicine and mathematics. In the correspondence of the Jesuit Christoph Clavius, preserved at the Gregorian University in Rome, are a few sheets⁶⁹ with the following comments of Ignatius to the *Compendium*, which had been interpreted for him: (1) the anticipation of the equinox cannot be as much as one day in 134 years because at the time of the Council of Nicaea it was on 21 or 20 March and it had not yet gone back to 10 March; (2) from many observations in the East one concludes that the sun anticipates one day in 132 years; (3) the idea of leaving out ten leap days during 40 years should be rejected; (4) adjustments at the turn of the centuries is too irregular; (5) the moon gains one day, not in 304, but in 276 years; (6) the 14th day of the lunation, according to the calculation of the *Compendium* by mean motions, differs sometimes two to four days from the true motion so that we would sometimes celebrate Easter with and sometimes before the Jews; (7) for the same reason Easter may sometimes be celebrated a month late. Finally, the Patriarch promised to present within a very few days the result of the research in his books, according to the commission by his Holiness. Indeed, in Florence at the Laurentiana a manuscript of Ignatius is preserved⁷⁰ in the Arabic language, written in Karšuni characters. Leonardo Abel, from Malta, confessor and translator for Arabians in Rome,⁷¹ translated it. The translation is in the Vatican Archives and is dated Rome, 12 March, 1580.⁷² Again, Ignatius refers to the order given to him by the Pope.⁷³ To a series of authorities, among them the Holy Pope Victor and Saint Ambrose in his letter to the bishops of Emilia on the celebration of Easter,⁷⁴ Ignatius adds others which the author of the proposed calendar had not noticed: *Didascalia*, chapter 23; the acts of the Council of Nicaea (The Pasch of Christ has to be the Sunday following immediately after the "Phase" of the Jews); canon 103 of the book of Iellesat. According to Ignatius it is not the conjunction of sun and moon which marks the beginning of the month but the day when the moon becomes visible minus 24 hours and this according to the horizon of

Jerusalem and as calculated by mean motions.⁷⁵ Thus the 14th day will be full moon but the *Compendium* makes full moon fall on the 16th day. The *Compendium* believes that the mean motion of the sun is irregular and hence the length of the year variable. But this has to be attributed to the instruments of observation. A long series of observations in the East, from 708 to 1472, establish that the length of the year is 365 days, 5 hours, 48 minutes, 53 5/12 seconds. There is however a motion of the apogee of the sun but this amounts only to 4 degrees during one revolution of the equinoctial point, which takes 25,550 years.⁷⁶ In 1570 the equinox reached 11 March; at the time of the Council of Nicaea it was on 21 and 20 March; Ignatius calculates that it then retrogrades one day in 132 years,⁷⁷ although the length of the year that he found previously leads to 126 years. Ignatius follows the Persian idea of keeping pace with the loss of one day in 132 years by delaying every eighth leap year so that not the 32nd but the 33rd year is a leap year.⁷⁸ Having done this four times we have gained one day in $4 \times 33 = 132$ years and we avoid extreme variations in the date of the equinox. On f. 22r Ignatius reveals the "greatest error" of the *Compendium*: "that it has not understood the first day of the month of the Jews." It counts the 14th day from noon, whereas the day of the Jews begins at sunset. Also, if conjunction takes place shortly before sunset, the next day will invariably be the first day of the month. It thus results that the month always begins more than one day too early in the *Compendium*. If we also take the anomaly of the moon's motion and the longitude difference between Rome and Jerusalem into account, the real full moon may occur up to five days later than calculated. Summarizing⁷⁹ Ignatius repeats that the *Compendium* makes the lunation begin one day too early and from noon, as astronomers do, but not as the Jews do. Ignatius joins a few tables to find Sunday letters according to several assumptions and he also adds thirty tables to find the new moons according to the opinion of the Holy Fathers and that of the *Compendium*.

The Report of the Commission

In his *Explicatio* Clavius asserts that the reform agrees completely with those rules of the Christians in the East which Patriarch Ignatius showed the commission in Rome,⁸⁰ in particular that Easter may be celebrated immediately after the 14th day of the lunation. Ignatius is among the members who signed the report of the commission dated 14 September,

1580. The President is Cardinal Sirleto; Ignatius signed in Arabic and in Chaldean. Leonardo Abel interpreted his signature. The other members are: Vincenzo di Lauro, from Tropea in Calabria, Bishop of Mondovì, from 1566-1587 († 1592); Séraphim Olivier (1538-1609), Frenchman from Lyon (born of an Italian mother), and auditor of the Rota; he became a cardinal in 1604; the German Jesuit, Christoph Clavius; the Spanish theologian, Pedro Chacón; Doctor Antonio Giglio; the Dominican professor of mathematics, Ignazio Danti. According to Schmid also Giovanni Battista Gabio, poet, professor of Greek at La Sapienza, was a member of the commission.⁸¹ In any case he translated the final text of the calendar reform into Greek.

The original text of the report is preserved in the Vatican Library.⁸² It was edited by F. Kaltenbrunner,⁸³ and this edition was copied by Gaspare Stanislao Ferrari, Jesuit professor at the Pontifical Gregorian University.⁸⁴ It had been, however, printed as early as 1703.⁸⁵ First of all, the commission declares that, although the Church can move the celebration of Easter to another time, civil life does not require this change. It is, therefore, preferable that the Council of Nicaea and the norms of the Fathers be followed. But how? The only consensus, if any, emerging from the enquiry about the *Compendium*, would seem to be that it had to be rejected. But already on 17 March, 1580 the commission had decided to fix the equinox at 21 March,⁸⁶ which Giglio had judged to be more according to the dignity of the Church (thus in the *Compendium*). In spite of much criticism the commission reported that all scientists who had been asked, had approved the epact cycle of Giglio, that is to say, all who had understood it, and apart from a few who would force the Church to follow the most difficult and cumbersome methods of astronomers.⁸⁷ Clavius himself had within the commission favoured the use of true motion;⁸⁸ but he thereafter, defended the decision of the commission most loyally. The commission definitely accepted the epact cycle of Giglio as the only one which yields a perpetual calendar. It agreed on a few guide-lines, called "hypotheses": If full moon occurs after six p.m., it is assigned to the next day. At new moon however, there is no need of so much precision. This seems to be the result of all the criticism by Ignatius. The equinox was set at 21 March because then nothing had to be changed in Mass books and breviaries. (This fulfilled a wish of the King of Spain.) The ten days should be left out in October 1581, the year of correction.

1581 did not become the year of correction. From the University of Louvain Adriaan van Zeelst (Adrianus Zeelstius) had sent a comment on

the *Compendium* dated 12 February, 1579.⁸⁹ It was sent to Rome by a delegate of the Pope, then in Cologne, Giovanni-Battista Castagna, Archbishop of Rossano, on 8 May, 1579.⁹⁰ van Zeelst praised the invention of Giglio but found it impractical and accessible only to experts. He promised an alternative of his own invention. The commission entertained great hopes for this invention. In a provisional version of the report of the commission in 1580 van Zeelst was called a German who praised the cycle of epacts and had promised to produce a better cycle within a year.⁹¹ At the end of September, 1580 the University of Louvain received from Rome an enquiry about the work of van Zeelst on the calendar reform. The completed work of van Zeelst was then sent to Rome,⁹² dated 1581. The author admitted that much was unintelligible to him. Giglio had set the epact of each year, the difference between solar and lunar year, to 11 days. van Zeelst came forth with the exact amount in hours, minutes, seconds and parts of seconds. An expert in the commission, the handwriting seems to be that of Clavius, wrote a criticism of the comments of van Zeelst.⁹³ The conclusion was that nothing prevented the realization of the reform which had been studied for so long a time in Rome under the presidency of the Bishop of Mondovì. This shows that Vincenzo di Lauro presided over the meetings as long as he was in Rome.⁹⁴ Sirleto must then have been a more remote leader. On 15 September, 1580 Vincenzo became nuncio in Turin.⁹⁵ On 13 January, 1581 he wrote to thank Cardinal Sirleto for the wise resolutions taken by the commission.⁹⁶ On 31 May, 1581⁹⁷ he wrote to Sirleto that he agreed with him about the discourse of van Zeelst which he had studied; he regretted that this had delayed the correction of the calendar to 1582.

But by now time had run out for the commission and probably for the Pope himself who was very eager to bring the matter to a final conclusion. In the same letter, just mentioned, Lauro declines the offer to prepare the bull and proposes Pedro Chacón. Chacón did prepare the text but Lauro had to contribute as well and sent his work together with an explanation of the calendar on 20 October, 1581 from Turin to Sirleto.⁹⁸ Chacón died on 26 October, 1581. On 11 February, 1582 Sirleto sent Antonio Giglio to Mondragone, the villa outside Rome where the Pope preferred to stay whenever he could, and there the Pope signed the bull on 24 February, 1582.⁹⁹ The table at which the Pope signed the document, is still shown at Mondragone. The handwritten text of the bull is in the bullarium of the Vatican Archives.¹⁰⁰ On 1 March the text was published at the doors of Saint Peter's Basilica, at the chancellery in Rome,

the building annex to the Basilica San Lorenzo in Damaso, located on what is today the Corso Vittorio Emanuele II, and at the Campo dei Fiori. It was printed together with the new perpetual calendar and the essentials of the new system and copies were dispatched to all Catholic countries through the mediation of the nuncios. As a reward to Antonio Giglio and to avoid uncontrolled reprinting of the calendar the Pope issued on 3 April, 1582 a brief prohibiting any publication of the calendar without the approval of Giglio. Giglio from his side promised together with the printer to provide plenty of copies in due time. Soon the nuncios received a few copies to be handed over to princes, bishops and other personalities together with a promise of cases full of books soon to be sent. However, these cases were so much delayed that scarcity of calendars became an obstacle in carrying out the reform.¹⁰¹ The Pope withdrew the privilege of Giglio on 20 November, 1582.¹⁰²

Contents of the Final Reform

Substantially the new calendar follows the proposal in the *Compendium* so that Clavius in his *Explicatio* could recognize Luigi Giglio as the primary author of the reform. The essence of the new calendar is the cycle of epacts, as shown in Table I, pages 212-213, and this is taken over wholeheartedly by the commission. Three leap days are to be left out in 400 years according to the Alfonsine length of the year which is a mean of the varying lengths of the year according to Copernicus. The cyclic dates of new and full moons were adjusted to the Prutenic tables so Clavius could say that the reform followed the Prutenic or Copernican tables.¹⁰³ However, all epacts have been made one unit less.¹⁰⁴ This may perhaps be seen as a response to the criticism of Ignatius that the *Compendium* took the conjunctions of the sun and moon for visible new moons. However, nowhere in the calendar nor in the *Explicatio* of Clavius is this distinction made. Perhaps the commission did not wish to take sides in a controversy.¹⁰⁵ Clavius gives as a reason¹⁰⁶ the need to avoid that Easter should be celebrated too early. Indeed, errors cannot be completely avoided because artificial cycles cannot represent exactly the real motions of sun and moon with their anomalies. The reform preferred, therefore, to place the new and full moons too late rather than too early because it would be a lesser error to celebrate Easter in the second month after the equinox than in the last month before the equinox or even to celebrate Easter on the same date as the Jews, that is on the fourteenth day of the moon instead of the day

thereafter. But perhaps the commission had made its choice by a somewhat experimental method. It may have calculated full moons according to the available astronomical tables and chosen its epacts such that a minimum of errors results. In fact, Clavius defends the epacts of the calendar by showing that any other choice would make the errors more frequent. We can check it also by comparing the Easter date for the years 2000 to 2500 with the dates for full moon, calculated by Professor T. Lederle.¹⁰⁷ It can be seen that a shift of the epacts by one day, whether forwards or backwards, increases the errors. In the following table P-Q means the number of weeks that (the Gregorian) Easter precedes the Easter date according to modern calculations of the dates for the real equinox and the real full moon. The top row lists the number of Easter dates between 2000 and 2500 where the different cases apply when the epacts of Giglio and the *Compendium* are used; next the numbers for the actual Gregorian calendar; finally the numbers for the case when the epacts are decreased by even one more unit.

P-Q	-5	-4	-1	+1	+3	+4
Giglio	1	1	88	0	3	14
Compendium						
Gregorian	1	1	26	9 (2)	0	17
- 1	0	4	4	45 (34)	0	13

In parentheses are the numbers which result when we keep to the principle that new moon after six in the evening is attributed to the following day. This principle, announced by the commission in its report of 14 September, 1580, I have not seen respected neither by the Gregorian calendar nor by Professor Lederle, but we see that it reduces the errors. It is obvious that the least errors occur when new moon is assumed to take place exactly when it becomes visible, one or two days after conjunction; so perhaps the criticism of Ignatius was accepted in practice, though never overtly. Nowadays we are able to compare the Gregorian calendar with accurate predictions of the true motions of the moon. Clavius made a comparison but had to be guided by the mean motions of the moon, the only ones which he could predict sufficiently. The saying that Gregorian cycles follow the mean motion of sun and moon is however misleading, as Clavius points out in his explanation of the calendar. For in the case of

the equinox the motion of the real sun is combined with the mean precession of the equinoxes. The real motion of the sun in the course of each year is irregular enough (the eccentricity of the orbit of the earth is large enough) to make the arrival of the real sun to the equinoctial point several days different from the date of the arrival of the mean sun at the same point. Thus astronomers in the days of Pope Gregory were aware that spring plus summer in the northern hemisphere lasts a week longer than autumn plus winter.

Another difference between the proposal of Giglio and the rules of the Gregorian calendar is in the method of producing hollow months, that is months of 29 days. Giglio had leapt over either the 29th or the first day of a lunation in the perpetual calendar to make lunations of 29 instead of 30 days. The commission changed this so that either the 24th or the 26th day of the lunation was left out. The basis for this change is the place of these epacts in the perpetual calendar. Epacts XXIX and XXX occur on 1 April and 31 March; epact XXV and 25 are placed at 4 or 5 April. Thus, just as in the old calendar, hollow months are produced by jumping a day on 6 April, which is the right date, if one wishes to be certain that all or nearly all paschal lunations are hollow. So the purpose of this change was to keep to tradition as closely as possible. As Clavius states it in his *Explicatio*:¹⁰⁸

It was preferable to choose the two epacts, XXV and XXIV, for the lunar adjustment because in this way the lunations according to the cycle of 30 epacts, and particularly (and more importantly) the 30 Easter lunations, coincide better with the lunations of the golden numbers of the Council of Nicaea, the decrees and decisions of which we have retained, as far as was possible and reasonable. For we see that the lunar adjustment was made by the golden numbers nearly at the same places at which it is made in the new calendar by the epacts XXV and XXIV.

Moreover, just as in that cycle of the golden numbers all 19 Easter lunations contain only 29 days . . . , thus also in the new cycle of epacts . . . all 30 Easter lunations contain each 29 days, except two lunations. . . .

On the other hand in the *Compendium* according to Giglio seven Easter lunations numbered 30 days.¹⁰⁹ Epact XXV is placed at 5 April, together with epact XXIV. But sometimes both these epacts are in use within one Metonic cycle. For example, for 1981 the epact was XXIV; only 11 years later, in 1992, it should be XXV. So twice within one

Metonic cycle six new moons, those of the hollow months, should fall on the same dates. This is unacceptable because it would mean that the moon's phases return to the same dates before the cycle is completed. Giglio invented the means of preventing this. Analogously, in the actual perpetual calendar, at the side of the epact XXVI, is written another number, 25, in Arabic numerals. Usually this number 25 is ignored. However, the epact of 1992 will not be XXV but 25; this means that the new moons of 1992 fall on the dates with epact 25. There is no risk that in another year within the same cycle new moons will fall on the epact XXVI because this epact XXVI is not used in a Metonic cycle when both XXV and XXIV are in use. For the sake of clarity the number 25 is placed also next to XXV in the months of 30 days to indicate where all the new moons fall in years like 1992 which have the epact 25. By similar reasoning the explanation applies to the epacts XX.19 at 31 December. The Arabic figure applies only to the rare case when the golden number 19 and epact XIX coincide. This happened in 1595 and five times in the seventeenth century. See Kaltenbrunner¹¹⁰ for a fuller explanation.

Tradition was a key concept for the reform, a tradition which was sanctified by the practice of the Church from the times of the Apostles of Jesus and particularly by the authority of the Council of Nicaea, the first Ecumenical Council convoked in 325 by the Emperor Constantine. No calendar rules were laid down at the Council other than that all Orthodox Christians were to celebrate Easter on the same day. Nor was it an offense when Christians happened to celebrate Easter on the same day as the Jews, but this should not be taken as a rule. The rule accepted was that Easter should be celebrated on the Sunday following the fourteenth day of the first lunation, that is the first lunation of which the evening of the fourteenth day falls after the vernal equinox, which was fixed on 21 March, where it was in the days of Nicaea. In addition to simple respect for Nicaea, the main reason for the commission to keep to this date was so as not to disturb the order of feasts whose dates were set some time after 325, and thus with 21 March for the equinox. Consequently, ten days had to be left out in order to change the equinox from 11 to 21 March. The cycle of Sunday letters received one single discontinuity when it was decided that the ten days should be left out after Thursday 4 October, to be followed by Friday 15 October. Why in October? Clavius explains¹¹¹ that we should suspect nothing more mysterious in this choice than that there are fewer feasts of saints in October. The feast of S. Francis of Assisi was saved because it is celebrated on 4 October. It is true that February, March

and April also contain few feasts of saints but they covered the seasons of Septuagesima, Lent and Easter which should not be disturbed, unless necessary.

The papal bull and Clavius¹¹² both emphasize that the new calendar is perpetual. This has been misunderstood, as if no adjustment should ever become necessary. The true meaning is that the calendar is perpetual, because the figures placed at each date refer to the epacts and not to golden numbers. The golden numbers of the years are fixed and cannot be changed because they result immediately from dividing the number of the year by 19. But for the epacts of the year one can select any of 30 possible combinations with the golden number and, therefore, the figures in the new calendar have never to be changed because they refer to these epacts. The system of combining epacts with golden numbers, the expanded table of epacts, is perpetual. All adjustments and changes are made in the table of adjustments which assigns to each century a letter referring to some row of the *Expanded Table of Epacts*.

*The Martyrology*¹¹³

On 4 November, 1581 Vincenzo di Lauro informed the Secretary of State, Cardinal de Como, that he had dispatched the projects by Pedro Chacón and himself for the papal bull and for the explanation of the calendar. He added that it would be necessary to publish the new martyrology simultaneously with the new calendar. He had proposed the formulation: "Calendarium, ad quod etiam accommodata est ratio martyrologii."¹¹⁴ The final text has:

... Calendarium immensa Dei erga Ecclesiam suam benignitate iam correctum atque absolutum hoc nostro decreto probamus, et Romae una cum Martyrologio imprimi, impressumque divulgari iussimus.

The martyrology is the list of saints who are commemorated on a certain day and in former times it was read every day during the liturgical morning office (hora prima). It needed a reform, partly because the list of saints and the statements about them had to be changed, but also because the reading begins with the announcement of the age of the moon that day.

Through the offices of Cardinal Sirleto, Juan Salón had received from the Pope the task of reforming the martyrology. In 1578 Salón delivered to the Pope an example¹¹⁵ for the months January and February.¹¹⁶ Salón claimed to have followed Paul of Middelburg for the

moon cycles and in his covering letter ¹¹⁷ he showed by a few examples how exactly his new moons coincided with the astronomical new moons, conjunction of sun and moon. All this work had to be done again after the acceptance of the new epacts to make them agree with these. For this reason and perhaps others Salón never finished his task, completing his martyrology only up until 8 July.¹¹⁸

In its report dated 14 September, 1580 the commission expresses the intention to finish soon the calculation of all the new moons for the martyrology. Before 6 December of the same year Cesare Baronio (1538-1607), Oratorian, Church historian, received the task of reforming the martyrology in cooperation with Sirleto, Curzio Franco, a canon, and others. Kaltenbrunner did not know of any new martyrology before 1586. However, the new martyrology was indeed published together with the new calendar. In 1582 the martyrology from 15 October on of that year was published.¹¹⁹ In 1583 the complete martyrology was issued with detailed explanations of what in the Roman Martyrology belongs to the announcement of the moon. It is completely in the style of Clavius' explanation of the calendar and was taken over literally in newer editions of the martyrology, the latest being that of 1956. The newer editions also contain an Apostolic Constitution of Pope Gregory on this new martyrology. It is dated 14 January, 1584 and thus had not been inserted in the two first editions of 1583. These editions contained too many errors so Sorleto had a corrected edition prepared;¹²⁰ it appeared in 1586 in Rome under the title: *Martyrologium... cum notationibus Caesaris Baronii Sorani*.¹²¹

The Explanation of the New Calendar

Despite all efforts to keep to tradition the reform was a novelty in its method of calculating Easter. Therefore, the books on the calendar contained not only the bull *Inter gravissimas* and the perpetual calendar with the list of epacts and the table for the adjustment of the epacts, these being the essentials of the new calendar, but also a short explanation. Several times one is referred for further information to a book on the new way of restoring the calendar. The task of preparing this book was given to Antonio Giglio.¹²² In 1585 Giglio finally announced that after much work and toil it was finished.¹²³ It was never published. Pope Gregory died on 10 April, 1585, Sirleto on 6 October of the same year and Giglio himself most probably before 1595.¹²⁴

On 20 October, 1581 Vincenzo di Lauro had sent his explanation of the new calendar to Cardinal Sirleto.¹²⁵ A short and clear explanation of the reform is found in the Vatican Library.¹²⁶ Schmid¹²⁷ attributed it to Pedro Chacón or Vincenzo di Lauro. It seems to be the one sent by di Lauro. Another copy is among the manuscripts of Christoph Clavius¹²⁸ and has a few corrections (in Clavius' hand?).

In 1583 Franciscus Flussas Candalla¹²⁹ wrote a booklet on the *Restoration of the Equinox*. It criticizes the Gregorian reform defending the change of the equinox to 25 March. By order of the Holy Father Clavius answered it and Sirleto sent the response of Clavius to Flussas with a covering letter dated 29 August, 1583.¹³⁰ We have the replies of Flussas¹³¹ and his covering letter to Sirleto¹³² dated Castelnau de Médoc, near Bordeaux, 2 February, 1584.¹³³

In the end, all the burden of defending and explaining the calendar turned upon Clavius. After having already written several defenses of the Pope's calendar, Clavius, as the only survivor of the commission, was charged by Pope Clement VIII with the task of writing the explanation of the calendar. He published it in 1603, and it is the standard work on the Gregorian calendar. The manuscript is preserved.¹³⁴

How Was the Calendar Promulgated and Published?

The reform was most easily accomplished in Italy, in Spain and in Portugal. As an example we have the circular letter which the Bishop of Iesi, Gabrielle de Monte, sent out in his diocese.¹³⁵ He ordered the jump from 4 to 15 October and added the calendar of the feasts for these days to his letter. He mentioned also the new epacts as if they needed no explanation. On 26 May the Secretary of State, the Cardinal of Como, sent the calendar in twelve copies to Cardinal Luigi Madruzzo, Legate of the Holy See at the Diet in Augsburg.¹³⁶ On 28 May the new calendar was sent to the nuncio of Savoy, Vincenzo di Lauro. By 12 June he had delivered copies to the Duke and to the Archbishop of Turin and the reform was to be accomplished on 4 October.¹³⁷ Alberto Bolognetti, nuncio in Poland, had not yet received the twelve copies of the calendar on 26 July, 1582.¹³⁸

The *Calendar* was translated into Italian by Reverend Bartholomeo Dionigi da Fano. The translation was published in Venice in the very year 1582. Two copies are at the National Library in Rome, one of them

belonged once to the Collegio Romano of the Jesuits. Apart from a few misprints it is a true rendering in Italian of the *Calendar* with its canons, preceded by the canon on the year of correction. The translation of the bull *Inter gravissimas* is followed by the decision on the printing of the *Calendar* in favour of Antonio Giglio, called Gilio in the translation.

The Decree of 1582 and Other Churches

Kaltenbrunner describes the calendar reform of Pope Gregory as another bone of contention cast into the Protestant world.¹³⁹ One might, however, see the reform in a quite different way. The Pope presented his bull in 1582 as an implementation of the decrees of the Council of Trent and thus as an act of the Counter Reformation, but he did so with the desire to meet the justified claims of the reformers. As part of a genuine reform in an important area of the Church's life, the decree of 1582 is an ecumenical act. On the other hand, as an implementation of the Council of Trent and set within the framework of the liturgy of the Roman Church, revised by Pope Pius V, the decree addresses itself only to those who accepted all this, that means, only to Roman Catholics. The Pope could not effectively impose an important measure on other Christians who did not recognize his supreme authority. In fact, in Rome the opinion was once voiced that it would be unworthy of the Pope to ask non-Catholics for their opinion.¹⁴⁰ Among all the authors writing on the proposed reform only one calls attention to the Christians of the Reformation. Bishop Hugolino Martelli of Glandèves pleaded energetically for a return to 25 March as date for the equinox, since, as he proposed, this was the date for the equinox at the time of the Gospel accounts and that Jesus would have, according to Martelli, been born on 25 December. Another of his arguments was that Christians of the Reformation would be more willing to accept a date referred to the Gospel than a date referred to tradition, to the Council of Nicaea. It was, however, too evident that Martelli had to supplement by much eloquence what was lacking in the rigour of his arguments, so no official notice was taken of his books.

The decree of 1582 recalls that a compendium of the planned reform had been sent to the "Christian rulers" and we know that it was sent in 1577 only to Catholic princes. Kaltenbrunner¹⁴¹ reproached the Pope that his reform had no regard for the Reformation. But the Pope could rightly expect that his *Calendar* reform would be received as a part of that general reform of the Church which was sought after with such diligence by the

Protestants that it caused a breach in Christianity. In fact, in the bull of 1582 the Pope mentioned especially Emperor Rudolph II and urged him to carry out the reform. The Emperor had many Protestant subjects and among them powerful princes. The Pope, knowing how strained the position of the Emperor was and realizing that he needed support, believed, perhaps, that the passage in the bull would strengthen the Emperor in his execution of the reform. Kaltenbrunner finds it a serious mistake of the Pope that he did not propose the calendar at the diet of Augsburg in 1582.¹⁴² How could Pope Gregory have done so? It belonged to the Emperor to propose reforms at the Diet. The Pope had done all that he could.¹⁴³ Although the bull did not carry a threat of excommunication, it was issued under the full authority of the Pope and concerned the important matter of the celebration among Christians of the greatest feast of the Church, the Resurrection.

The reaction of the Oriental Churches to the proposed Calendar reform was first registered in Venice by Giuseppe Zarlino (1519-1590), the famous director of the choir at St. Mark's and author of books on music and other subjects. In 1578 he delivered his report on the *Compendium* to the nuncio of the Pope in Venice. Less than a month later Zarlino addressed himself again to the nuncio in a letter of moving concern for relations with the Orientals. Zarlino had met a Greek who had heard that the Pope planned to fix Easter on a certain day in March or April. He feared great scandal and damage to the relations between the Churches and prayed God to forbid it. Zarlino reassured him that the Pope only wished to reduce the vernal equinox to a fixed day. They agreed that it would be worst of all if one Church celebrated the Passion of our Lord while the other at the same time celebrated his Resurrection, and that could happen even in the same house because there was "an infinity of" mixed marriages.¹⁴⁴ The problem must have been discussed in the commission. The letter was among its acts. J. Schmid mentioned it among the papers which Antonio Giglio borrowed, only he could not recognize the name Zarlino.¹⁴⁵ In the first drafts of the report of the commission, before the final text of 14 September, 1580, the plan was seriously discussed of delaying the reform in order to invite representatives of the Patriarchs of Constantinople, Antioch and Alexandria to the commission. Patriarch Ignatius supported this plan. But would the Orientals accept a reform? It was thought best to invite Patriarch Ignatius and a Greek bishop from Venice to the commission. Both had then to be informed accurately on the reform.¹⁴⁶ We have seen that Ignatius signed the report of the commission on 14 September

1580 and his comments on the *Compendium* show that he was informed at the latest during March 1580. On 28 April, 1580 Cardinal Sirleto and Vincenzo di Lauro had considered "the cycles which the Orientals use"¹⁴⁷ and when the Dalmatian Pietro Cedolini was in secret relations with the Patriarch of Constantinople from October 1580 to April 1581 he explained the calendar reform but the Patriarch answered no to the Doge Nicolò de Ponte.¹⁴⁸ On 17 April, 1581 a Greek colonel from Candia, Antonio Eudemonjani, wrote from Venice to the Pope. He proposed negotiations with the four Oriental patriarchs in order to avoid differences between Greeks and Latins in places where they were mixed.¹⁴⁹ A further delay threatened the reform. Much work had been done and everything was ready. The Pope was approaching his eightieth year, a formidable age. On 17 June, 1581 Clavius wrote to Vincenzo di Lauro. He had discussed the matter with the president of the commission, Cardinal Sirleto, and they agreed that they would finalize the reform in any case. Thus had Vincenzo di Lauro also decided while he was present in Rome, Clavius wrote.¹⁵⁰ This must have been the result of the discussions mentioned above, and it agrees with the fact that the final report of 14 September, 1580 did not mention discussions with the Orientals. Although the commission did not oppose negotiations, it insisted on pursuing the reform without delay and thus not waiting for the consent of the Orientals. Thus the Pope proceeded. He signed the bull on 24 February before he had come to any agreement with the Patriarch Jeremiah but subsequently he negotiated with him. This subsequent dealing between the Pope and the Patriarch is discussed in the paper by Hoskin in this volume. We might only add that the desire to correct the offense caused by not proposing the *Compendium* to the Greeks occasioned the edition in Greek of the decree *Inter gravissimas* with the calendar and its rules in Rome in 1583. It also contained the tables and rules of Giambattista di Zanti for the application of the reform to the Calendar of Greek feasts.¹⁵¹

The personality and the role of Patriarch Ignatius of Antioch may be the clue to another edition in Rome of the same texts in Karšuni, that is, in Arabic with Syrian characters. J. Schmid speaks about the efforts of Ignatius to persuade the Jacobite Churches of Antioch and of Alexandria to accept the Gregorian Calendar.¹⁵² Schmid assumes that the Jesuits, Giambattista Eliano and Giovanni Bruno, in their mission of 1582 to Syria had a mandate in this respect. However, in a letter dated 3 March, 1581 Clavius assures Eliano that "the patriarch" had already accepted the calendar. When Leonardo Abel, the interpreter of Ignatius in Rome, arrived in Syria

in 1583 with some copies of the Chaldean version of the calendar, the Patriarch of Antioch refused to accept the calendar unless all other nations did so, because he was afraid of the Turks.¹⁵³ Also for the Patriarch of the Nestorian Chaldeans Abel delivered some Chaldean versions of the calendar. In Alexandria Eliano had to rewrite the text in Arabian characters so that the Copts could read it.¹⁵⁴ Giovanni Battista di Zanti, professor of astronomy in Bologna,¹⁵⁵ who composed the rules for the application of the calendar reform to the calendar of the Greek Churches,¹⁵⁶ published in 1583, by order of the Pope, tables for the Syrians, in Arabic, printed in Syrian characters.¹⁵⁷

There is also an edition of the Gregorian calendar in Armenian, Rome 1584. One copy exists in the Vatican Library¹⁵⁸ and one in the National Library in Rome.¹⁵⁹ The manuscript is in the Vatican Library and the translator is the Armenian Marcus Antonius Abagarius.¹⁶⁰ A colony of Armenians in Galicia in Poland, subjects of Patriarch Jeremiah, addressed themselves to him on behalf of the calendar;¹⁶¹ in 1583 the Roman Catholic Archbishop of Lemberg dealt with them on the same subject. During the mission to Syria mentioned above Leonardo Abel delivered a copy of this version to the Patriarch of Armenia, Cacciadore in Sis.¹⁶²

An Evaluation

The Gregorian reform of the calendar has often been praised for its high scientific standard. Such an authority in astronomy as Delambre found the Gregorian calendar better than its own authors had supposed. Delambre regrets only that the Church did not take the decision to have Easter on a fixed Sunday.¹⁶³

However, Giglio, Clavius and finally Pope Gregory chose the scientifically most difficult path out of respect for tradition. The authors of the Gregorian reform declared repeatedly that they preferred to keep to the rules of celebrating Easter derived from the Israelite religion and the Christian history of salvation and that they did not wish to break with any traditions but on the contrary to return to the exact, original intentions of the Fathers of the Council of Nicaea. Their achievement in science and in Church politics is fundamentally a great act of religion, one of respect for tradition in the Church.

The Gregorian calendar is first of all a reform, part of the vast and much required reform of the whole Church. It is also part of the Catholic Counter-reform, understood as encountering the equitable demands of the

Protestants. If Pope Gregory had made use of his acknowledged power to set Easter on a fixed Sunday, thereby abandoning old Christian and biblical traditions, what would have been the reactions from Protestant regions in Europe? While we cannot answer this question, we know how negative their reaction was on the most moderate, considerate measure which the Roman authors did take.

The bull *Inter gravissimas* was issued late, only half a year before the execution of the reform. A calendar reform has to be promulgated at the latest in the calendar year preceding the year of the reform. We have seen the reason for the delay but we understand also the impatience of Clavius and other members of the commission. Vittorio Peri is quite indignant about the behaviour of Clavius in the affair concerning the Greeks. He contrasts Clavius' attitude to the generous minds of Pope Gregory and Cardinal Sirleto.¹⁶⁴ However, Clavius did not write that *he* wished to press the reform through before negotiations with the Orientals. He says: *We*, Sirleto and I, agreed, and he appeals to a previous decision by di Lauro. Not Clavius, but Sirleto was president of the commission; not Clavius, but Pope Gregory signed the bull on 24 February, 1582 before Rome had sent a representative to Constantinople. The Pope and Sirleto are the responsible parties. It is true that both Pope Gregory and Sirleto opened their minds with regard to Christians of the East after they had assured the execution of the reform. But the same holds for Clavius. Already in his letter of 3 March, 1581 he wrote to Giambattista Eliano:¹⁶⁵

About the calendar, which is already finished, you should not be anxious, because the Pope plans to let two very able men come from there, and the patriarch has also subscribed to our calendar and admitted that it is very good. I hope that it will soon be published, because the Pope is quite eager.

This letter, predating the one to Vincenzo di Lauro, is of a quite different tone. In the letter to Lauro Clavius had to defend the reform; in the letter here quoted he wanted to encourage a brother-in-religion for a very delicate and difficult expedition. In 1583 Clavius defended the change of the equinox to 21, and not to 25, March because the alternative would cause much disturbance "to all Christians but most of all to Greeks and Orientals"¹⁶⁶ and in his *Explicatio* Clavius gave similar reasons and regards for "all the Greek Churches which are numerous and which above all have to be taken into consideration".¹⁶⁷ Indeed, the Greeks were upset when they heard the rumour that the equinox would be reduced to 25 March and became satisfied when they learned that it would be changed to 21 March.¹⁶⁸

Clavius also told how Patriarch Ignatius of Antioch appeared at the meeting of the commission with books from the East and it was verified that the measures planned by the commission were in full agreement with these texts.¹⁶⁹ If in the letter to Lauro Clavius shows himself more upset than usual, it is a natural reaction because Clavius had done much tedious work of lengthy and accurate calculations. But above all we should remember gratefully that citizens of Venice, where the Christian West and East met most intimately, took the initiative of proposing negotiations with the East; indeed, the first one seems to have been an Orthodox layman.

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12. Giovanni Padovani, *Opera sopra la Riforma dell'Anno* (Verona, 1576).
13. Giovanni Padovani, *De Temporum Computatione, atque Divisione* (Verona, 1577).
14. Bibl. Vat., Cod. Vat. lat. 7180, 234-237; ff. 313-326 contain another proposal to the Pope.
15. *Ibid.*, 6214, 1-17; 6217, 48-59.
16. *Ibid.*, 6214, 7v.
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21. Giulio Aromolo, *Papi - Astronomi - Epatte - Luigi Giglio, astronomo, "primus auctor della riforma gregoriana del Calendario* (Naples, 1963); with bibliography. Also: Luigi Lenzi & Filippo Taveriti, *Gli Scrittori Calabresi*, 2nd ed., vol. II (Reggio di Calabria, 1955), 34-36.
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26. Alessandro Piccolomini, *De Nova Ecclesiastici Calendarii, pro legitimo Paschalis celebrationis tempore, restituendi forma, Libellus* (Siena, 1578), 70.
27. *Ibid.*, 70-72.
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32. Bibl. Vat., *Cod. Vat. lat.* 6210, 185.
33. *Ibid.*, 6543, 77r.
34. Cf. Schmid, *op. cit.* (ref. 7), 391-393 and Georg Denzler, *Kardinal Guglielmo Sirleto (1514-1585) Leben und Werk* (München, 1964), 102.
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37. Wilhelm van Gulik - Konrad Eubel, *Hierarchia Catholica*, vol. III (Münster, 1910), 293; but already in 1575 Lauro calls Gigli bishop of Piacenza; Bibl. Vat., *Cod. lat.* 6543, 5r.
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40. *Ibid.*, ch. 17.
41. Ludwig Freiherr von Pastor, *Geschichte der Päpste im Zeitalter der katholischen Reformation und Restauration: Vol. IX, Gregor XIII. (1572-1585)* (Freiburg im Breisgau, 1923), 207.
42. Bibl. Vat., *Cod. Vat. lat.* 6194, 67r. A. Oliver in: *Lexicon für Theologie und Kirche*, vol. II (Freiburg im Breisgau, 1958), col. 1000. A. Orive, CHACÓN, Pedro, in *Diccionario de Historia Ecclesiastica de España*, vol. II (Madrid, 1972), 673. Pedro Chacón is not to be confounded with his contemporary Alonso Chacón, Dominican and author of historical works.
43. According to his epitaph, now in S. Maria di Monserrato: Vincenzo Forcella, *Iscrizioni delle chiese e d'altri edifici di Roma del secolo XI fino ai giorni nostri*, vol. III (Roma, 1873), 238.
44. Bibl. Vat., *Cod. Vat. lat.* 7093, 432r; 6214, 129 and 130; 6417, 17-24.
45. August Theiner, *Annales Ecclesiastici*, vol. II (Rome, 1856), § 90, p. 578.
46. Clavius, *op. cit.* (ref. 6), ch. 11 § 5 and ch. 13 § 18.
47. *Ibid.*, ch. 13 § 20, p. 167.
48. Gordon Moyer, "The Gregorian Calendar", *Scientific American* CCXLVI (May 1982) 108, 110, has found some copies in Italy. The copy preserved in the Vatican Library is catalogued Racc. I.IV.963, int. 4, among *Miscellanea Calendarij Gregoriani*. Biblioteca Nazionale in Rome has another one. However, these are all copies of the *Compendium*, not of the book of Luigi Giglio.

49. Clavius, *op. cit.* (ref. 6) ch. 12 § 9, pp. 147-149.
50. Following the proposal by Bartholomeus Caligarius in 1548, according to Josef Schmid, "Zur Geschichte der Gregorianischen Kalenderreform. III. Nachträge", *Historisches Jahrbuch der Görres-Gesellschaft*, V (1) (München, 1884), 54-55.
51. Francesco Giuntini, *op. cit.* (ref. 5), 8.
52. E.g. Bibl. Vat., *Cod. Vat. lat.* 6193, 345; copy in: Bibl. Vat., *Cod. Barb. lat.* 5741, 35. The *Cod. Vat. lat.* 5645 contains the original letters of the rulers and academies together with some of the commentaries by their experts; the index of the codex lists also other commentaries with a reference to the codices in which they are contained. Among the correspondence of Christoph Clavius in the Archives of the Gregorian University (AUG) we find copies of both the answer of the Emperor Rudolph II and of his letter to the Pope, both mentioned by the Secretary of State, in cod. 530, 20 and 96.
53. Schmid, *op. cit.* (ref. 7), 393-405.
54. Kaltenbrunner, *op. cit.* (ref. 25), 29.
55. Bibl. Vat., *Cod. Vat. lat.* 5645, 11.
56. Bibl. Vat., *Cod. Vat. lat.* 5645, 148-150; printed in *Cod. Vat. lat.* 10493, 138, as noted on *Cod. Vat. lat.* 5645, 148, but I have not found the printed text.
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58. See also Schmid, *op. cit.* (ref. 50), 67 ref. 1.
59. From the hand of Giuntini also a manuscript exists entitled: *Discorso di mr. Francesco Giuntini Fiorentino Dottore in theologia sopra la reformatione del anno fatto dalla Santità di N.S. Papa Gregorio XIII*; Bibl. Vat., *Cod. Vat. lat.* 6217, 18-29. It is of later date and reacts to explanations of the calendar reform published by Giovanni de Zanti and Antonio Casarina.
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73. *Ibid.*, 3v.
74. *Ibid.*, 4v-5r.
75. *Ibid.*, 7r.
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90. *Nuntiaturberichte aus Deutschland*, vol. II, ed. Joseph Hansen (Berlin, 1894), 287-288.
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94. Cf. Maffei, *op. cit.* (ref. 68), vol. I, Book IV, § XXXIII, p. 312. Also Saint Robert Bellarmine in a letter dated 18 September, 1579: Xavier-Marie Le Bachelet S.J., *Bellarmin avant son Cardinalat 1542-1598. Correspondance et Documents* (Paris, 1910), 110.
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108. Clavius, *op. cit.* (ref. 6), ch. 10 §§ 8-9, p. 103.
109. *Ibid.*, ch. 10 § 11, p. 104.
110. Ferdinand Kaltenbrunner, "Die Polemik über die Gregorianische Kalenderreform", *Sitzungsberichte der phil.-hist. Classe der kaiserlichen Akademie der Wissenschaften*, LXXXVII (Wien, 1877), 500.
111. Clavius, *op. cit.* (ref. 6), p. 66.
112. *Ibid.*, ch. 15 § 15; ch. 7 § 1 and § 5, pp. 73, 82, 85.
113. Pastor, *op. cit.* (ref. 41), 204-205, with bibliography.
114. Bibl. Vat., *Cod. Vat. lat.* 6417, 51-52; Schmid, *op. cit.* (ref. 7), 407.
115. Cf. Bibl. Vat., *Cod. Reg. lat.* 2023, 316.
116. Bibl. Vat., *Cod. Vat. lat.* 6217, 1-32.
117. Bibl. Vat., *Cod. Reg. lat.* 373, 18-19.
118. Bibl. Vat., *Cod. Vat. lat.* 6214, 103-128, 101-102.
119. It was probably not composed by Antonio Giglio; cf. Denzler, *op. cit.* (ref. 34), 114. But it contains the privilege of Giglio to be mentioned in this paper.
120. Cf. Bibl., *Cod. Vat. lat.* 6147, 15-16; the letter is probably written by Curzio Franco because it comes from Naples.
121. Kaltenbrunner, *op. cit.* (ref. 25), 21.
122. Schmid, *op. cit.* (ref. 7), 408-411.
123. Bibl. Vat., *Cod. Vat. lat.* 6417, 58.
124. Schmid, *op. cit.* (ref. 7), 411; cf. Bibl. Vat., *Cod. Vat. lat.* 5645, 1.
125. Bibl. Vat., *Cod. Vat. lat.* 6194, 174.
126. *Ibid.*, 6214, 30.
127. Schmid, *op. cit.* (ref. 50), 73.
128. *AUG* (ref. 52), 529, 286-288.

129. This "Flussas" is a Frenchman; cf. Schmid, *op. cit.* (ref. 50), 75. François de Foix (1512-1594) was Count of Candalle and Bishop of Aire. Philippe Tamizey de Larroque, "Notes et documents inédits pour servir à la biographie de Christophe et de François de Foix-Candalle, évêques d'Aire". Abstract from *Revue de Gascogne* (Paris, 1877).
130. Bibl. Vat., *Cod. Vat. lat.* 7093, 346.
131. Bibl. Vat., *Cod. Vat. lat.* 6217, 60-69.
132. Bibl. Vat., *Cod. Vat. lat.* 8102, 1-4. Denzler, *op. cit.* (ref. 34), 108 seems to have misunderstood the situation.
133. Bibl. Vat., *Cod. Reg. lat.* 2023, 279-280, a further criticism of the reform was made by Giovanni Vincenzo (?) Della Porta in Naples, who respectfully expressed the opinion that Giglio was not very lettered.
134. *AUG* (ref. 52), cod. 774.
135. Bibl. Vat., *Cod. Vat. lat.* 10727, 73.
136. *Nuntiaturreichste aus Deutschland*, vol. II (ref. 90), pp. 421-3.
137. Bibl. Vat., *Cod. Vat. lat.* 6417, 27.
138. *Monumenta Poloniae Vaticana*, vol. V (ref. 101), 411, 425.
139. Kaltenbrunner, *op. cit.* (ref. 110), 486.
140. Bibl. Vat., *Cod. Vat. lat.* 6417, 14r.
141. Kaltenbrunner, *op. cit.* (ref. 110), 494.
142. *Ibid.*, 503.
143. Cf. *Nuntiaturreichste aus Deutschland*, vol. II (ref. 90), 423. The Vatican Archives contain in *Archivio dell'Arce* 5506, Arm. XV, n. 4, 1627 on ff. 340-341 in print the constitution of the Pope for those who "for various obstacles" did not start the new calendar in October 1582. It is also in print in *Secr. Brev.* 53, 231-232. The manuscript is there on f. 228r. The essentials of the constitution are drafted on f. 229r and f. 233r. The constitution is dated 7 November, 1582. Cf. also the note on *Secr. Brev.* 53, 235v, dated 11 November, 1582. It orders a jump from Sunday 10 to Monday 21 February, 1583. The same codex AA 5506 contains on f. 329 in print the calendar from Sunday to Ash Wednesday. The constitution has been printed in the *Kalendarium Gregorianum Perpetuum* published in Douai in 1583. The original edition of the new calendar had already detailed indications for how to introduce the calendar in October 1583 or following years. These indications were originally destined for those in India and America who did not receive the news on the reform in due time.
144. Bibl. Vat., *Cod. Vat. lat.* 7057, 58-59, copy.
145. Schmid, *op. cit.* (ref. 7), 509; *op. cit.* (ref. 71), 546.
146. Bibl. Vat., *Cod. Vat. lat.* 6214, 71-72; 45-46.
147. Vittorio Peri, *Due Date. Un'unica Pasqua. Le origini della moderna Disparità Liturgica in una Trattativa Ecumenica tra Roma e Costantinopoli (1582-1584)*. Con appendice di documenti (Milan, 1967), 24.
148. Vittorio Peri, "La Data della Pasqua. Segno d'Unità e Occasione di Scandalo". *Vita e Pensiero*, XLVIII (9) (1965), 674-675.
149. Bibl. Vat., *Cod. Vat. lat.* 6415, 33-34.
150. *Ibid.*, 6417, 49.
151. *Ibid.*, 67, 69-92.
152. Schmid, *op. cit.* (ref. 71), 586-588.

153. *Ibid.*, 589-591.
154. Letter of 11 April, 1584; Bibl. Vat., *Cod. Vat. loc.* 6210, 83r; 6417, 66.
155. Bibl. Vat., *Cod. Vat. lat.* 6214, 18r.
156. *Ibid.*, 55-61.
157. Bibl. Vat., N. VII, 16.
158. Racc. gen. Orient. IV, 597.
159. 55.9.K.32.
160. According to Schmid, *op. cit.* (ref. 71), 585 in *cod. Angelicus* A 6, 18.
161. Schmid, *op. cit.* (ref. 71), 563.
162. *Ibid.*, 591.
163. Jean-Baptiste Joseph Delambre, *Histoire de l'Astronomie Moderne*, vol. 1 (Paris, 1821), pp. 2, 12, 58.
164. Peri, *op. cit.* (ref. 148), 673-674; *op. cit.* (ref. 147), 149-151.
165. ARSI (*Historical Archives of the Society of Jesus in Rome*) Gall 95, II, 122r.
166. Bibl. Vat., *Cod. Vat. lat.* 6217, 60v.
167. Clavius, *op. cit.* (ref. 6), ch. 3 § 1, p. 65.
168. Bibl. Vat., *Cod. Vat. lat.* 6194, 414v, 463v.
169. Clavius, *op. cit.* (ref. 6), ch. 1, towards the end of § 7, p. 61.